064
FGUS73 KFGF 121514
ESFFGF
MNC005-007-027-029-051-057-069-077-087-089-107-111-113-119-125-
135-159-167-NDC003-005-017-019-027-035-039-063-067-071-073-077-
081-091-095-097-099-281200-

Probabilistic Hydrologic Outlook
National Weather Service Grand Forks
1014 AM CDT Thu Mar 12 2020

...SPRING FLOOD AND WATER RESOURCES OUTLOOK...

...RED RIVER BASIN OUTLOOK FOR RIVER FLOOD POTENTIAL...

This outlook covers the Red River of the North
and its Minnesota and North Dakota tributaries.

...HIGH RISK OF MAJOR FLOODING THIS SPRING ALONG THE MAINSTEM RED RIVER WITH GENERALLY MODERATE TO MAJOR FLOODING ALONG THE TRIBUTARIES...

* This 90-day outlook covers the period from March 16, 2020 to June 14, 2020.

.OUTLOOK SUMMARY...

* Probabilities for exceeding Major, Moderate, Minor Flood Stage...

Major Flooding...

There is a high risk (greater than 65 percent) of major flooding at Fargo/Moorhead, Halstad, Grand Forks/East Grand Forks, Oslo, Drayton, and Pembina on the Red River. In North Dakota, there is a high risk of major flooding at the West Fargo Diversion and Harwood on the Sheyenne River and at Abercrombie on the Wild Rice River.

There is a medium risk (35 to 65 percent) of major flooding in North Dakota at Valley City and Kindred on the Sheyenne River and at Neche on the Pembina River. In Minnesota, there is a medium risk of major flooding at Climax on the Sand Hill River, at Crookston on the Red Lake River and at Hendrum on the Wild Rice River.

There is a low risk (less than 35 percent) of major flooding throughout the remainder of the basin with this outlook issuance.

Moderate Flooding...

There is a high risk (greater than 65 percent) of moderate flooding in North Dakota at Enderlin and Mapleton on the Maple River, at Hillsboro on the Goose River and at Neche on the Pembina River. In Minnesota, there is a high risk of moderate flooding at Sabin on the South Branch of the Buffalo River, Hawley and Dilworth on the Buffalo River, Hendrum on the Wild Rice River, Climax on the Sand Hill River, Crookston on the Red Lake River, and Hallock on the Two Rivers River.

There is a medium risk (35 to 65 percent) of moderate flooding of moderate flooding at Wahpeton/Breckenridge on the Red River. In Minnesota there is a medium risk of moderate flooding at Twin Valley on the Wild Rice River, High Landing on the Red Lake River, and at Alvarado on the Snake River. In North Dakota, there is a medium risk of moderate flooding at Lisbon on the Sheyenne River.

Minor Flooding...

There is a high risk (greater than 65 percent) of minor flooding at Wahpeton and Hickson on the Red River. In North Dakota there is a high risk of minor flooding at Minto on the Forest River and Valley City on the Sheyenne River. In Minnesota there is a high risk for minor flooding at Twin Valley on the Wild River River, at Shelly on the Marsh River, and at Alvarado on the Snake River.

There is a medium risk (35 to 65 percent) of minor flooding in North Dakota at Walhalla on the Pembina River. In Minnesota there is a medium risk for minor flooding at Roseau on the Roseau River.

*Note: With the recent completion of the Grafton Bypass, river flows will be divided between the main channel and the diversion. This will significantly reduce the impact on the City of Grafton and surrounding areas protected by the diversion, and the in town river gage at Grafton is not likely to reach the stages depicted here. However, locations outside the protection of the diversion still have the depicted risk probability associated with historic levels on the Grafton gage.

.OUTLOOK DISCUSSION...

Hydrologic and climate conditions which affect each of the several factors that significantly determine the timing and magnitude of spring snowmelt flooding within the Red River of the North are discussed below:

* SNOWPACK CONDITIONS...

The current snowpack and associated water content is above normal for this time of year, even with the quiet weather conditions the last few weeks. Winter season snowfall was above average (roughly 125 to 275 percent of normal) for much of the basin. The exception is across of far northeastern ND and northwestern MN. The current water content of the snow ranges from 1.0 to 2.5 inches across the Pembina, Forest and Park River basins in North Dakota. 2.5 to 5.0 inches of snow water equivalent still exists a majority of the basin which is above end of winter normals and leads to a high runoff potential. Across Bois de Sioux and Rabbit basins some melt runoff has occurred and water is held up in ditches and streams.

* SOIL MOISTURE

At the time of freeze-up, soil moisture was extremely high and well above normal across much of the basin due to record precipitation during the fall. Some fields and ditches even had standing water freeze in place.

* FROST DEPTHS...

Current frost depth values are less than normal due to early and persistent snowcover this winter and recent warmth to start March. The far southern valley currently reports frost depth values of 0 to 10 inches while most locations range from 10 to 30 inches.

* RIVER FLOWS...

Base streamflows are much above normal, near record levels for this time of year due to the record wet fall. The Red River and most tributaries (generally south of Oslo) are currently flowing at the 95th percentile or greater. Tributaries north of Grafton to Argyle are showing flows in the 76th to 95th percentiles.

* RIVER ICE...

River ice and lake ice thicknesses remain less than normal and are quite variable across the region.

* FACTORS YET TO BE DETERMINED...
- Further snowpack growth,
- Rate of snowmelt/thaw,
- Heavy rain on snow or frozen ground during thaw or peak flood,
- Heavy rain on ice-covered rivers causing short-term ice jams.

* SHORT TERM WEATHER FORECAST...

A continued cool pattern for the next 7 days will keep most of the temperatures below freezing for much of the basin for most of the time. As a result snow melt runoff will be at a minimum and confined to the far southern valley where are afternoon temperatures may rise above freezing for a few hours a day. A more active pattern precipitation pattern is also expected with snowfall this weekend across the northern half of the basin and the risk for another system impacting the area again towards the end of next week.

* LONG TERM CLIMATE OUTLOOK...

Climate Predict Center outlook for the rest of March indicates a colder than normal period with precipitation near to above normal with the rest of spring showing equal chances for temperatures and precipitation or no clear signal of wet, dry, or normal.

.NEXT SPRING FLOOD OUTLOOK...

This will be the last probabilistic outlook for the season as we transition into the spring melt and deterministic river forecasts will become available.

.FLOOD OUTLOOK PROBABILITIES TABLES...

The following message has two sections: the first gives the current and normal/historical chances of river locations reaching their minor, moderate, and major flood category. The second gives the current chances of river locations rising above river

stages listed.

...Red River Long-Range Probabilistic Outlook by Flood Category...

Valid from March 16, 2020 to June 14, 2020

In Table 1 below, the current (CS) and historical (HS), or normal, probabilities of exceeding minor, moderate, and major flood stages are listed for the valid time period.

CS values indicate the probability of reaching a flood category based on current conditions.

HS values indicate the probability of reaching a flood category based on historical, or normal, conditions.

When the value of CS is greater than HS, the probability of exceeding that level is higher than normal. When the value of CS is less than HS, the probability of exceeding that level is lower than normal.

...Table 1--Probabilities for Minor, Moderate, and Major Flooding
Valid Period: 03/16/2020 - 06/14/2020

	Categorical Flood Stages (FT)			Current and Historical Chances of Exceeding Flood Categories as a Percentage (%)					
				Minor		Moderate		Major	
Location	Minor	Mod	Major	CS	HS	CS	HS	CS	HS
Red River of the North.....									
WAHPETON	11.0	13.0	15.0	>95	63	57	32	27	15
HICKSON	30.0	34.0	38.0	65	30	23	14	<5	<5
FARGO	18.0	25.0	30.0	>95	82	>95	43	>95	26
HALSTAD	26.0	32.0	37.5	>95	35	>95	19	90	11
GRAND FORKS	28.0	40.0	46.0	>95	59	>95	32	92	11
OSLO	26.0	30.0	36.0	>95	64	>95	57	>95	27
DRAYTON	32.0	38.0	42.0	>95	50	>95	34	93	11
PEMBINA	39.0	44.0	49.0	>95	54	>95	43	>95	23

	Categorical Flood Stages (FT)			Current and Historical Chances of Exceeding Flood Categories as a Percentage (%)					
				Minor		Moderate		Major	
Location	Minor	Mod	Major	CS	HS	CS	HS	CS	HS
Minnesota Tributaries.....									
Note: The Roseau numbers consider the flow through its diversion									
SABIN	13.0	15.0	19.0	>95	54	>95	17	8	<5
HAWLEY	8.0	9.0	11.0	>95	36	88	23	9	<5

DILWORTH	13.0	20.0	26.0	>95	67	>95	20	6	<5
TWIN VALLEY	10.0	12.0	14.0	91	17	38	6	12	<5
HENDRUM	20.0	28.0	32.0	>95	56	>95	22	62	6
SHELLY	14.0	20.0	23.0	>95	30	33	11	7	<5
CLIMAX	20.0	25.0	30.0	>95	26	>95	12	45	7
HIGH LANDING	12.0	12.5	13.0	59	18	44	17	28	13
CROOKSTON	15.0	20.0	23.0	>95	53	94	31	51	12
ABOVE WARREN	67.0	71.0	75.0	33	18	7	<5	<5	<5
ALVARADO	106.0	108.0	110.0	90	21	55	15	11	6
HALLOCK	802.0	806.0	810.0	>95	61	93	44	10	11
ROSEAU	16.0	18.0	19.0	56	24	21	16	6	9

	Categorical Flood Stages (FT)			Current and Historical Chances of Exceeding Flood Categories as a Percentage (%)					
				Minor		Moderate		Major	
Location	Minor	Mod	Major	CS	HS	CS	HS	CS	HS
North Dakota Tributaries.....									
ABERCROMBIE	10.0	12.0	18.0	>95	39	>95	36	>95	20
VALLEY CITY	15.0	16.0	17.0	87	10	62	9	56	6
LISBON	15.0	17.0	19.0	>95	10	57	9	34	6
KINDRED	16.0	19.0	20.5	>95	18	>95	10	61	9
WEST FARGO DVRSN	18.0	20.0	21.0	>95	11	81	10	75	9
HARWOOD	84.0	86.0	91.0	>95	24	>95	22	>95	11
ENDERLIN	9.5	12.0	14.0	>95	24	95	10	15	<5
MAPLETON	18.0	21.0	23.0	>95	37	>95	16	32	<5
HILLSBORO	10.0	13.0	16.0	>95	15	85	9	11	<5
MINTO	6.0	8.0	11.0	83	21	12	8	<5	<5
GRAFTON*	12.0	13.5	14.5	33	22	16	8	8	6
WALHALLA	11.0	16.0	18.0	62	19	<5	<5	<5	<5
NECHE	18.0	19.0	20.5	84	30	75	28	44	19

LEGEND:
CS = Conditional Simulation (Outlook for current conditions)
HS = Historical Simulation (" " normal conditions)
FT = Feet (above gage zero datum)

...Red River Long-Range Probabilistic Outlook by River Stage...

Valid from March 16, 2020 to June 14, 2020

LOCATION	95%	90%	75%	50%	25%	10%	05%
Red River of the North.....							
WAHPETON	11.8	11.9	12.4	13.5	15.3	16.3	17.2
HICKSON	27.3	27.7	28.7	31.6	33.9	35.5	36.6
FARGO	32.0	32.5	33.3	34.7	36.1	38.2	39.7
HALSTAD	36.9	37.5	38.2	38.8	39.5	40.0	40.8
GRAND FORKS	45.3	46.2	47.4	48.4	50.6	53.3	55.5

OSLO	37.2	37.3	37.5	37.7	37.9	38.0	38.1
DRAYTON	41.9	42.2	42.5	43.0	44.0	45.1	45.8
PEMBINA	51.6	51.9	52.2	52.8	53.7	54.6	54.8

Minnesota Tribs:	95%	90%	75%	50%	25%	10%	05%
South Fork Buffalo River.....							
SABIN	15.4	16.0	16.5	17.0	17.5	18.7	19.4
Buffalo River.....							
HAWLEY	8.7	8.9	9.4	9.8	10.4	10.9	11.5
DILWORTH	21.7	22.4	23.0	23.6	24.3	25.4	26.2
Wild Rice River.....							
TWIN VALLEY	9.5	10.1	10.6	11.7	12.6	14.4	15.6
HENDRUM	30.3	31.2	31.7	32.1	32.9	33.7	34.5
Marsh River.....							
SHELLY	16.1	16.7	17.6	18.7	20.3	22.6	23.4
Sand Hill River.....							
CLIMAX	26.5	27.2	28.4	29.7	32.5	35.7	37.7
Red Lake River.....							
HIGH LANDING	9.9	10.4	11.4	12.2	13.1	13.3	13.4
CROOKSTON	19.8	20.6	21.4	23.1	25.4	28.1	29.2
Snake River.....							
ABOVE WARREN	65.2	65.3	65.9	66.5	67.6	69.7	71.3
ALVARADO	105.4	105.9	107.1	108.2	109.2	110.0	110.7
Two Rivers River.....							
HALLOCK	805.6	806.1	806.7	807.9	808.9	810.0	810.6
Roseau River..... considering the flow through the Roseau diversion							
ROSEAU	13.4	13.7	14.9	16.5	17.7	18.5	19.7

North Dakota Tribs:	95%	90%	75%	50%	25%	10%	05%
Wild Rice River.....							
ABERCROMBIE	20.2	20.8	21.3	22.6	24.1	25.3	27.3
Sheyenne River.....							
VALLEY CITY	14.4	14.7	15.4	17.6	20.0	24.2	26.1
LISBON	15.3	15.4	16.1	17.7	20.4	26.2	28.6
KINDRED	19.6	19.8	20.2	20.8	21.2	21.2	21.2
WEST FARGO DVRSN	19.3	19.3	21.0	21.3	21.3	21.3	21.3
HARWOOD	91.4	91.4	91.6	91.7	92.0	92.2	92.3
Maple River.....							
ENDERLIN	12.0	12.5	12.8	13.1	13.6	14.3	15.3
MAPLETON	22.2	22.3	22.5	22.7	23.1	23.8	24.1
Goose River.....							
HILLSBORO	11.8	12.5	13.8	14.3	14.9	16.1	17.3
Forest River.....							
MINTO	5.0	5.8	6.3	7.0	7.7	8.3	9.0
Park River.....							
GRAFTON*	10.0	10.4	10.7	11.2	12.7	14.1	15.6
Pembina River.....							
WALHALLA	9.2	9.6	10.5	11.5	12.5	13.9	15.0
NECHE	17.0	17.6	18.9	20.3	21.1	21.4	21.5

*Note: With the recent completion of the Grafton Bypass, river flows will be divided between the main channel and the diversion. This will significantly reduce the impact on the City of Grafton and

surrounding areas protected by the diversion, and the in town river gage at Grafton is not likely to reach the stages depicted here. However, locations outside the protection of the diversion still have the depicted risk probability associated with historic levels on the Grafton gage.

.THE OUTLOOK PRODUCTION PROCESS...

This long range probabilistic outlook is based on a series of peak river levels or crests taken from the forecast hydrograph results of the NWS Community Hydrologic Prediction System (CHPS). The model is run for multiple scenarios starting at current river levels and soil conditions using 64 years (1949-2012) of past precipitation and temperature conditions that were experienced for those past years during the time-frame of the outlook period. These crests can then be ranked from lowest to highest and assigned an exceedance probability. For example, for a series of 50 years, the lowest ranked crest has 49 crests above it and since 95 percent of the crests are above it, it is assigned a 95 percent probability of exceedance (POE).

A YouTube video on "How to Interpret River Outlook Products" is at:

www.youtube.com/watch?v=pSoEgvsnpv4

The probabilities can be used for risk management by using them as an indication of the range of crests that may be expected during the valid period of the outlook. By providing a range of peak river level probabilities, the NWS is contributing to the area's Decision Support Services that help with long-range flood planning and response readiness. This outlook is a part of NOAA's National Weather Service's AHPS (Advanced Hydrologic Prediction Services).

.ADDITIONAL INFORMATION SOURCES...

The AHPS Long-Range Probabilistic Hydrologic Outlooks are issued each month typically between the first and second Friday after mid-month. However, Spring Flood and Water Resources Outlooks are issued several times leading up to the spring melt period, usually on Thursdays beginning in late February or early March and ending in early April, depending on the spring flooding conditions.

This outlook is also presented as graphs of the probability of stage exceedance for the full period and for weekly intervals during the period. These graphs, along with explanations for interpreting them, are available from the NWS Grand Forks AHPS web page:

www.weather.gov/grandforks or weather.gov/fgf

then click on the "Rivers and Lakes" tab above the map.

Current river conditions for all river forecast points in the Red River of the North and Devils/Stump Lake basins are also available on our website, as well as 7-day forecasts when river levels at forecast points are in or near flood.

Additional Probabilistic Hydrologic Outlooks will be issued monthly

throughout the rest of the year during the later part of the month or as conditions warrant.

Refer to the separate Devils Lake Probabilistic Hydrologic Outlook for Devils and Stump Lakes Probability of Exceedance levels and low-water non-exceedance levels.

If you have any questions, contact the NWS at 701-772-0720.

You can follow us on Facebook at: www.facebook.com/NWSGrandForks and on Twitter at: @NWSGrandForks.

$$

www.weather.gov/fgf

NNNN